

REMARKS

In view of the above amendments and the following remarks, reconsideration of the rejections and further examination are respectfully requested.

The specification and abstract have been reviewed and revised to improve their English grammar and U.S. form. The amendments to the specification and abstract have been incorporated into a substitute specification and abstract. Attached are two versions of the substitute specification, a marked-up version showing the revisions, as well as a clean version. No new matter has been added.

Claims 1-14 have been cancelled without prejudice or disclaimer to the subject matter contained therein and replaced by new Claims 15-31. Specifically, new independent claims 15 and 27 represent amended versions of original independent claims 1 and 8, respectively. Moreover, new claims 16-26 depend from claim 15, and new claims 28-31 depend from claim 27.

Claims 1-5 and 7-14 were rejected under 35 U.S.C. § 102(b) as being anticipated by Hickerson (US 3,150,485). Further, dependent claim 6 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Hickerson in view of Moore et al (US 2,281,485). The rejections regarding claims 1-14 are considered moot based on their above-mentioned cancellation. Further, these rejections are believed clearly inapplicable to new claims 15-31 for the following reasons.

New Apparatus Claims 15-26 are Patentable Over Hickerson

New independent claim 15 recites a propulsion device using an oxidizer and liquid fuel for propulsion, the propulsion device including, in part (1) a combustion chamber; (2) a surface area increasing device disposed inside the combustion chamber; (3) a preheating device operable to preheat the surface area increasing device; (4) a liquid fuel supply device operable to supply the liquid fuel to the inside of the combustion chamber; and (5) an oxidizer supply device operable to supply the oxidizer to the inside of the combustion chamber (a) so as to create an oxidation atmosphere inside the combustion chamber, and (b) so that the oxidizer collides with the surface area increasing device, wherein when (a) the surface area increasing device is preheated by the preheating device in the oxidation atmosphere, and (b) the liquid fuel supply device

supplies the fuel to the inside of the combustion chamber, propulsion is generated. Hickerson fails to disclose or suggest the arrangement of a surface area increasing device disposed inside of a combustion chamber and a preheating device for heating the surface area increasing device, wherein an oxidizer and liquid fuel collide with the preheated surface area increasing device within an oxidation atmosphere inside the combustion chamber to generate propulsion, as recited in independent claim 15.

In contrast, Hickerson teaches a variable thrust rocket engine wherein an oxidizer and fuel are preheated prior to entry into a combustion chamber. Specifically, Hickerson teaches a fixed housing 10 wherein the walls 17 and 18 form a cooling chamber 19 in which the oxidizer is preheated before it enters an injector area or oxidizer chamber 24 (i.e. combustion chamber) (see Figs. 1 and 2, col. 2, lines 18-29). Moreover, Hickerson teaches that fuel flows through pintle 42 so as to be preheated prior to entry into chamber 24 by ways of exiting fuel orifice 36 (see Figs. 1 and 2, col. 2, lines 49-67). Based on the configuration disclosed by Hickerson preheated fuel is injected into oxidation chamber 24 through fuel orifice 36 and the oxidizer is injected into the oxidation chamber 24 through the oxidizer orifice 22, wherein neither the fuel or the oxidizer encounter a heating element or a surface area increasing device once injected into the oxidation chamber 24 (i.e., combustion chamber) (see Fig. 2). Accordingly, the oxidizer and fuel are not heated within the oxidation chamber 24 where the fuel and oxidizer are mixed together; on the other hand, the preheating is completed only prior to entry into the oxidation chamber 24.

Further, Hickerson teaches that a small portion of the oxidizer flows into counterbore 64 through channel 19 into space 68 through apertures 69 so as to collide with igniter 60 having a catalyst 70 and is decomposed so as to create an oxidation atmosphere in oxidation chamber 24 and initiate combustion therein (see Figs. 1, 2, and 4, col. 3, lines 25-34, 51-55, and col. 3, line 70-col. 4, line 2). Accordingly, the oxidation atmosphere is created within counterbore 64 and then passes to oxidation chamber 24 (i.e., combustion chamber).

Hickerson teaches that preheated oxidizer is injected into a counterbore having a catalyst to create an oxidation atmosphere and preheated fuel and preheated oxidizer are injected into an oxidation chamber for generating propulsion, wherein the preheated

oxidizer and preheated fuel are injected into the oxidation chamber without a heating element and without a surface area increasing device. Accordingly, Hickerson does not disclose or suggest (1) a preheated surface area increasing device disposed inside a combustion chamber, (2) a combustion chamber in which both liquid fuel and oxidizer are supplied so as to collide with the preheated surface area increasing device (i.e., combining the oxidizer and the fuel in the combustion chamber so that the oxidizer and the fuel collide with the preheated surface area increasing device), (3) the creation of an oxidation atmosphere in a combustion chamber which contains a preheated surface area increasing device, or (4) the generation of propulsion within a combustion chamber which contains a preheated surface area increasing device. Simply stated, Hickerson does not teach any of the above-mentioned limitations of independent claim 15 because injecting preheated fuel and preheated oxidizer into an oxidation chamber without a heating element or a surface area increasing device does not disclose or suggest any of the four distinguishing features discussed above.

In view of the above, it is respectfully submitted that the Hickerson reference does not anticipate the invention as recited in new claims 15-26. Furthermore, Hickerson does not suggest the above-discussed limitations of claims 15-26. Therefore, it would not have been obvious for one of ordinary skill in the art to modify the Hickerson reference so as to obtain the invention of new claims 15-26. Accordingly, it is respectfully submitted that new claims 15-26 are clearly allowable over Hickerson.

New Method Claims 27-31 are Patentable Over Hickerson

New independent claim 27 recites a method of igniting a propulsion device, wherein the preheating of a surface area increasing device, the supplying of the liquid fuel into the combustion chamber, and the supplying of the oxidizer into the combustion chamber is similar to that recited in independent claim 15 (i.e., propulsion is generated when the oxidizer collides with the preheated surface area increasing device and the liquid fuel). Accordingly, the limitations of independent claim 27 are similar to the distinguishing limitations of independent claim 15 discussed above.

For the same reason as discussed above, it is respectfully submitted that the Hickerson reference does not anticipate the invention as recited in new independent

claims 27-31. Furthermore, Hickerson does not suggest the above-discussed limitations of claims 27-31. Therefore, it would not have been obvious to one of ordinary skill in the art to modify the Hickerson reference so as to obtain the invention of new claims 27-31. Accordingly, it is respectfully submitted that new claims 27-31 are currently allowable over Hickerson.

New Claims 15-31 are Patentable Over Hickerson in View of Moore


The Examiner rejected original dependent claim 6 as being unpatentable over Hickerson in view of Moore. The Examiner relied on Moore for teaching the use of ceramic to support a catalyst containing silver. However, although Moore does in fact disclose the use of a catalyst to decompose hydrogen peroxide, Moore does not disclose or suggest the above-discussed features of independent claims 15 and 27 which are lacking from Hickerson (i.e., supplying fuel and an oxidizer into a combustion chamber so as to collide with a preheated surface area increasing device and generate an oxidation atmosphere and propulsion). Accordingly, the combination of Hickerson in view of Moore fails to disclose or suggest the features of independent claims 15 and 27. Thus, it is apparent that independent claims 15 and 27 and the claims that depend therefrom are allowable of Hickerson in view of Moore.

Because of the above-mentioned distinctions, it is clear that the features of new claims 15-31 are not taught or suggested by Hickerson or Moore, or any combination thereof, and as a result, claims 15-31 are patentable over the references relied upon in the rejection. Furthermore, it is submitted that the distinctions are such of that person having ordinary skill in the art at the time of the invention would not have been motivated to modify the references in such a manner so as to result in, or otherwise render obvious the present invention as recited in new claims 15-31. Accordingly, claims 15-31 are clearly allowable over the references relied upon by the Examiner.

Accordingly, in view of the above amendments and remarks, it is submitted that the present application is now in condition for allowance and an early notification thereof is earnestly requested. The Examiner is invited to contact the undersigned by telephone to resolve any remaining issues.

Respectfully submitted,

Hideki MORIAI et al.

By: 
Nils E. Pedersen
Registration No. 33,145
Attorney for Applicants

NEP/ALD/nrj
Washington, D.C. 20006-1021
Telephone (202) 721-8200
Facsimile (202) 721-8250
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